THE MINING INDUSTRY IN MONTANA

A Survey On Occupational Employment With Labor Market Characteristics

1976

RESEARCH AND ANALYSIS SECTION
EMPLOYMENT SECURITY DIVISION
DEPARTMENT OF LABOR AND INDUSTRY
BOX 1728
Helena, Montana
59601

April 1977

JOB SERVICE

THE MINING INDUSTRY IN MONTANA:

A SURVEY ON OCCUPATIONAL EMPLOYMENT WITH LABOR MARKET CHARACTERISTICS

1976

STATE OF MONTANA

THOMAS L. JUDGE, GOVERNOR

RESEARCH AND ANALYSIS SECTION
EMPLOYMENT SECURITY DIVISION
DEPARTMENT OF LABOR AND INDUSTRY
Box 1728
Helena, Montana

APRIL 1977

TABLE OF CONTENTS

ACKNOWLEDGEMENT

The research staff at the Employment Security Division would like to thank all of the individuals, agencies, and businesses that made this publication possible. First, we would like to mention all of the firms that cooperated with the program by taking their valuable time to supply occupational employment information for their particular firms. We are proud of their contribution to a program that will provide good current information on the occupational structure of Montana's important mining industry. Because of their efforts, our educators, manpower planners and tomorrow's work force will have better information in the process of choosing their careers.

We would also like to thank the state members in our 23 job service offices. These dedicated individuals did a professional job in contacting the sampled employers and explaining the purpose of the survey.

In regard to the processing, analysis, and computer services, our sincere appreciation goes to the U.S. Bureau of Labor Statistics for their valuable technical help, as well as our own data processing staff, especially Mr. Gary Poepping.

Finally, we would like to thank our cooperating partners; the Governor's Manpower Training Council and the Superintendent of Public Instruction - Vocational Education, for their patience and financial help.

TOTAL EMPLOYMENT IN THE MINING INDUSTRY IN MONTANA

1958 - 1976 - Projected 1985

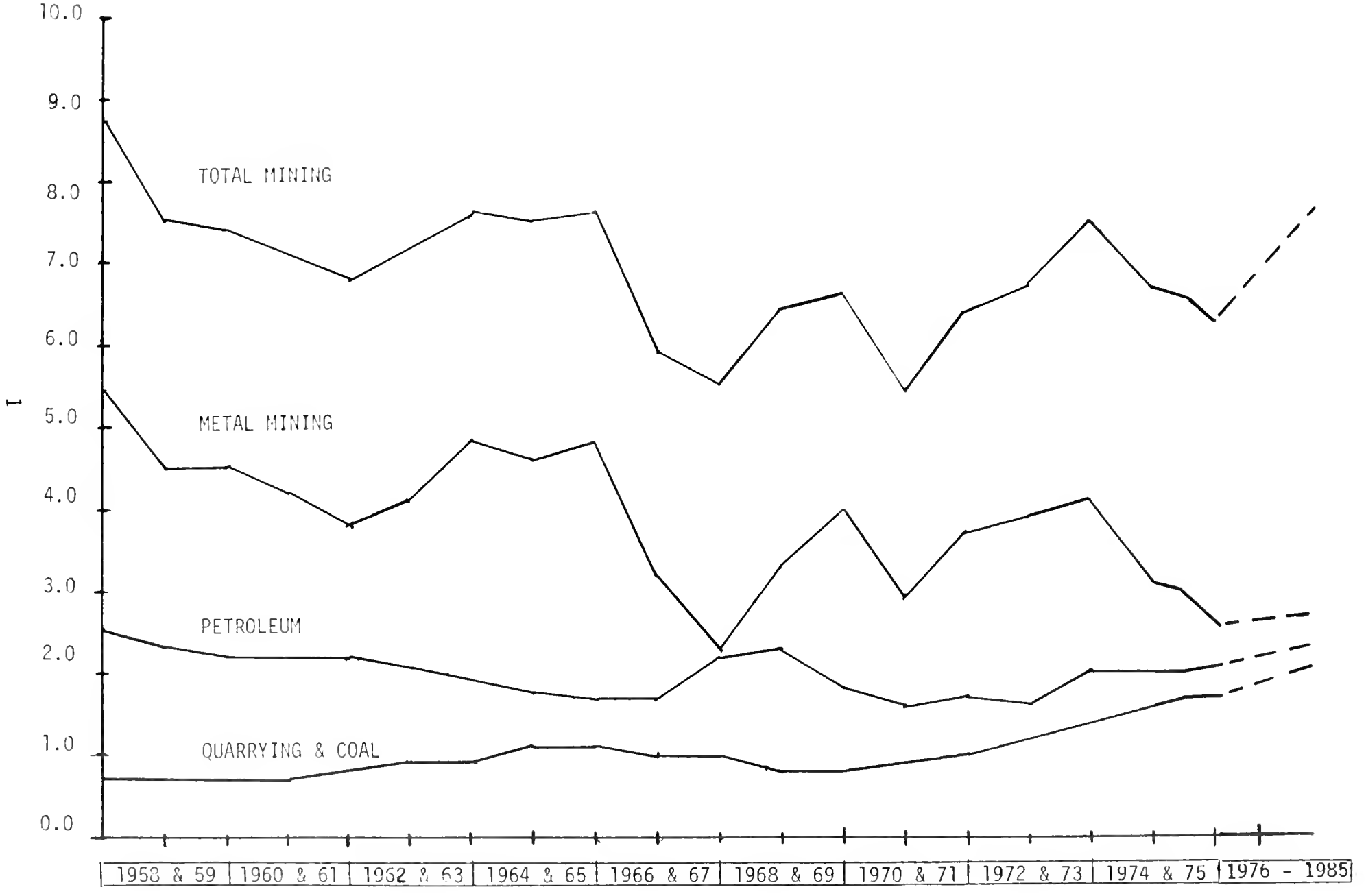


TABLE I

TOTAL WAGE AND SALARY EMPLOYMENT
IN THE MINING INDUSTRY

(SIC 10 - 14)

1960 - 1976

YEAR	ANNUAL AVERAGE EMPLOYMENT [1]
1960	7,400
1961	6,900
1962	6,800
1963	7,100
1964	7,600
1965	7,500
1966	7,600
1967	5,900
1968	5,500
1969	6,400
1970	6,600
1971	5,400
1972	6,400
1973	6,700
1974	7,500
1975	6,700
1976	6,200

[1] All data are rounded to the nearest hundred.

TABLE II

TOTAL MINING EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT

1970, 1974 AND PROJECTIONS FOR 1985.

(SIC 10, 12, 13, 14)

	1970		1974		PROJECTED 1985	
INDUSTRY	EMPLOYMENT	PCT.	EMPLOYMENT	PCT.	EMPLOYMENT	PCT.
MINING	6,695	2.63	7,718	2.58	7,813	2.28
Metal Mining	3,975	1.56	4,149	1.39	2,653	.78
Coal Mining	102	.04	516	.17	1,120	.33
Crude Petroleum & Natural Gas	1,874	.74	2,084	.70	2,416	.77
Quarrying & Non-Metal Mining	744	.29	969	.32	1,044	.30

OCCUPATIONAL EMPLOYMENT

THE MINING INDUSTRY

(SIC 10 - 14)

METAL MINING

COAL MINING

NON-METALLIC MINING AND QUARRYING

CRUDE PETROLEUM AND NATURAL GAS EXTRACTION

TABLE III

PERCENT DISTRIBUTION OF TOTAL EMPLOYMENT IN MINING BY MAJOR OCCUPATIONAL GROUP

MAJOR OCCUPATIONAL GROUP	INDUSTRY SURVEY INDUSTRY 10	SURVEY INDUSTRY 12	SURVEY INDUSTRY 13	SURVEY INDUSTRY 14	TOTAL
10000 Managers & Officers	1.37	4.35	9.69	7.14	5.24
20000 Professional Occupations	3.76	3.60	6.69	2.58	4.50
30000 Technical Occupations	2.11	1.49	1.90	1.17	1.82
40000 Service Occupations	0.70	0.38	0.06	0.00	0.52
50000 Maintenance, Construction, Repair, Material Handling, & Power Plant Occupations	88.29	82.61	71.39	84.78	81.66
60000 Clerical Occupations	3.76	7.45	9.54	4.33	6.18
70000 Sales Occupations	0.01	0.12	0.73	0.00	0.08
TOTAL ALL OCCUPATIONS	100.00	100.00	100.00	100.00	100.00

TABLE IV

ACTUAL CROSS INDUSTRY EMPLOYMENT BY MAJOR OCCUPATIONAL GROUP

MAJOR OCCUPATIONAL GROUP	INDUSTRY SURVEY INDUSTRY 10	SURVEY INDUSTRY 12	SURVEY INDUSTRY 13	SURVEY INDUSTRY 14	TOTAL
10000 Managers & Officers	33	35	184	61	313
20000 Professional Occupations	91	29	127	22	269
30000 Technical Occupations	51	12	36	10	109
40000 Service Occupations	17	*	11	*	31
50000 Maintenance, Construction, Repair, Material Handling, & Power Plant Occupations	2134	665	1355	724	4878
60000 Clerical Occupations	91	60	181	37	369
70000 Sales Occupations	*	*	*	*	5
TOTAL ALL OCCUPATIONS	2417	805	1898	854	5974

* Employment is less than 5 people.

THE METAL MINING INDUSTRY

(SIC 10)

REPORT ON EMPLOYMENT IN THE METAL MINING INDUSTRY

INDUSTRY DESCRIPTION

The metal mining industry is composed of establishments engaged in exploration and extraction of metallic minerals. "These ores are valued chiefly for the metals contained for use as components in alloys, chemicals, pigments, etc. This major group also includes all ore dressing and beneficiating operations," which may be performed at the mine site, or at a separate station. "These include mills which crush, grind, wash, dry, sinter, or leach ore, or perform gravity separation or flotation operations."[1/]

Within the metal mining industry, there are eight minor industrial groups which include the following:

1. Iron Ores
2. Copper Ores
3. Lead and Lime Ores
4. Gold and Silver Ores
5. Bauxite and other Aluminum Ores
6. Ferroalloy Ores, except Vanadium
7. Metal Mining Services. (Examples include contract drilling for metals, mine development, exploration, test drilling etc.)
8. Miscellaneous Metal Ores (ie. mercury ores, uranium, antimony, platinum, tin ore, vanadium ores, and others)

EMPLOYMENT TRENDS

Since 1960, Employment in the metal mining industry varied from a high of 4800 in 1966 to a low of 2300 in 1968. During the 15 year period from 1960 through 1974, employment averaged almost 3900 people, although the trend was generally downward, with labor disputes accenting this negative trend. However, in 1975 and 1976 the employment picture further weakened as total employment fell 1700 from 1974 levels. The indefinite closure of underground copper mining, technology, and low market prices were primarily responsible for this situation.

1/ Standard Industrial Classification Manual, 1972 Executive office of the President: Office of Management and Budget, U.S. Government Printing Office Washington, D.C. Page 32.

The employment outlook in this industry is almost completely out of the range of an accurate forecast. External forces such as new substitute products, market supply and demand for metal products and the consequent price structure, energy priorities and other factors will all likely determine the future of this important Montana industry.

OCCUPATIONAL CHARACTERISTICS

In August 1976, the metals industry provided jobs for over 2400 Montana workers. Among the seven major occupational groups, 88% reported occupational attachment to the maintenance and production group. All ten of the largest specific occupations came from this group. The largest specific occupation was truck drivers, accounting for nearly 13% of total employment. This was followed by auto mechanics, maintenance foremen, heavy equipment operators, laborers, and welders and flame cutters. In fact, the six above occupations accounted for 1250 jobs, 52% of the industry's employment.

The professional and clerical occupations combined for 180 workers, representing 7.5% of the 2400 metal mining workers.

TABLE V

TOTAL WAGE AND SALARY EMPLOYMENT
IN THE METAL MINING INDUSTRY

(SIC 10)

1960 - 1976

YEAR	ANNUAL AVERAGE EMPLOYMENT [1/]
1960	4,500
1961	4,200
1962	3,800
1963	4,100
1964	4,800
1965	4,600
1966	4,800
1967	3,200
1968	2,300
1969	3,300
1970	4,000
1971	2,900
1972	3,700
1973	3,900
1974	4,100
1975	3,100
1976	2,400

[1/] All data are rounded to the nearest hundred.

TABLE VI

ESTIMATED EMPLOYMENT OF SELECTED OCCUPATIONS
IN THE METAL MINING INDUSTRY

(SIC 10)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
TOTAL ALL OCCUPATIONS		2417			
MANAGERS AND OFFICERS		33	NA	1.36	67
All Other Managers & Officers	19000	33	31.87	1.36	67
PROFESSIONAL OCCUPATIONS		91	NA	3.71	NA
Civil Engineer	21004	5	5.65	.20	8
Industrial Engineer	21006	3	6.66	.12	8
Mining Engineer	21010	7	12.20	.28	17
Safety Engineer	21012	8	5.86	.33	8
All Other Engineers	21900	11	---	.45	25
Chemists	22201	6	14.99	.24	17
Systems Analysts EDP	24000	3	6.66	.12	8
Accountants & Auditors	25401	13	5.65	.53	17
Personnel & Labor Relations Specialists	25465	8	5.86	.33	8
All Other Professional Workers	29000	27	NA	1.11	33
TECHNICAL OCCUPATIONS		51	NA	2.08	NA
Draftsman	32003	3	6.66	.12	8
Surveyor	32008	13	5.60	.53	17
All Other Engineering Technicians	32900	9	8.74	.37	17
Science Technicians	33000	19	6.06	.78	8
All Other Technicians	39000	7	NA	.28	8
SERVICE OCCUPATIONS		17	NA	.70	8
Guards, Watchmen, & Doorkeepers	42000	17	5.99	.70	8
PRODUCTION, MAINTENANCE CONSTRUCTION, REPAIR, MATERIAL HANDLING, & POWER PLANT OCCUPATIONS		2134	NA	88.11	NA
Mechanic, Automotive	51008	254	5.60	10.48	17
Mechanic, Maintenance	51043	25	5.98	1.03	8
All Other Mechanics	51900	18		.74	8
Truck Driver	54000	314	4.41	12.96	33

METAL MINING INDUSTRY
(CONT.)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
PRODUCTION, ETC., (CONT.)					
Bratticeman	55A30	3	6.66	.12	8
Carpenter	55A47	23	3.79	.94	17
Apprentice	55A47	1	9.99	.04	8
Cranemen, Derrickmen, & Hoistmen	55A82	48	5.95	1.98	8
Dispatcher, Car	55A90	1	9.99	.04	8
Dredge Operator	55A98	3	6.66	.12	8
Drier Operator	55B02	9	20.84	.37	17
Driller, Hand	55B03	32	5.95	1.32	8
Driller, Machine	55B04	79	17.40	3.26	33
Dump Operator	55B07	30	5.89	1.23	8
Electrician	55B12	82	5.96	3.38	8
Apprentice	55B12	5	5.65	.20	8
Foreman Maintenance	55B29	223	2.72	9.20	33
Heavy Equipment Operator	55B52	182	5.47	7.51	17
Lampman	55B68	6	5.77	.24	8
Machinist	55B84	53	5.90	2.18	8
Apprentice	55B84	7	5.89	.28	8
Maintenance, Material	55B86	29	45.31	1.19	33
Helper, Trade	55B87	43	22.42	1.77	17
Oiler	55C06	90	5.96	3.71	8
Painter	55C12	5	5.65	.20	8
Panel Board Operator	55C20	14	5.84	.57	8
Plumber & or Pipefitter	55C30	40	5.94	1.65	8
Apprentice	55C30	3	6.66	.12	8
Shaker Tender	55C80	15	5.88	.61	8
Stationary Boiler Firerer	55C90	7	5.89	.28	8
Stationary Engineer	55C91	35	6.02	1.44	8
Tipple Operator	55D21	3	6.66	.12	8
Welders & Flamecutters	55D46	121	2.94	4.99	25
Apprentice	55D46	5	5.65	.20	8
Belt Repairmen	55D98	3	6.66	.12	8
Pumpman	55M76	29	5.86	1.19	8
Separation Tender	55R62	13	5.75	.53	8
Conveyor Operator	55R90	26	6.02	1.07	8
Yard Engineer, Locomotive	55S57	2	7.07	.08	8
Mill Grinder Operator	55S98	59	12.15	2.43	33
All Other Operatives	59002	60	-----	2.55	17
All Other Laborers	59003	155	3.03	6.39	33
CLERICAL OCCUPATIONS		91	-----	3.71	
Stenographer	61200	2	7.07	.08	8
Accounting Clerk	61301	9	5.98	.37	8
File Clerk	61330	7	5.89	.28	8

METAL MINING INDUSTRY
(CONT.)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
CLERICAL (CONT.)					
General Clerk	61333	15	18.74	.61	17
Payroll and or Timekeeper	61351	2	7.07	.08	8
Personnel Clerk	61352	1	9.99	.04	8
Secretary	61368	10	30.08	.41	33
Switchboard Operator	61376	6	5.77	.24	8
Typist	61392	2	7.07	.08	8
Clerical Supervisor	61396	2	7.07	.08	8
All Other Office Clerical	61900	3	6.66	.12	8
Stock Clerk Storeroom & Warehouse	62008	32	5.95	1.32	8

TABLE VII

ESTIMATED EMPLOYMENT BY MAJOR OCCUPATIONS

IN THE METAL MINING INDUSTRY

(SIC 10)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
Major Occupational Group		
TOTAL ALL OCCUPATIONS	2420	100.00 1/
MANAGERS AND OFFICERS	30	1.37
PROFESSIONAL OCCUPATIONS	90	3.76
TECHNICAL OCCUPATIONS	50	2.11
SERVICE OCCUPATIONS	20	.70
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING, AND POWER PLANT OCCUPATIONS	2130	88.29
CLERICAL OCCUPATIONS	90	3.76
SALES OCCUPATIONS	*	*

1/ Occupational totals are rounded and may not add to the total.

* Employment is less than 5 people.

TABLE VIII

ESTIMATED EMPLOYMENT IN MAJOR SPECIFIC OCCUPATIONS

IN THE METAL MINING INDUSTRY

(SIC 10)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
TRUCK DRIVER	314	12.96
AUTO MECHANICS	254	10.48
FOREMAN MAINTENANCE	223	9.20
HEAVY EQUIPMENT OPERATORS	182	7.51
ALL OTHER LABORERS	155	6.39
WELDERS AND FLAMECUTTERS	121	4.99
OILER	90	3.71
ELECTRICIANS	82	3.38
DRILLER, MACHINE	79	3.26
MILLER AND/OR GRINDER OPERATORS	59	2.43
MACHINISTS	53	2.18
TOTAL	1612	66.49%
TOTAL ALL OCCUPATIONS	2417	100.00%

THE COAL MINING INDUSTRY

(SIC 12)

REPORT ON EMPLOYMENT
IN THE COAL MINING INDUSTRY

INDUSTRY CHARACTERISTICS

The coal mining industry in Montana concerns the mining of bituminous, sub-bituminous and lignite coals. In the Standard Industrial Classification Manual 1972, this type of mining is classified in SIC 12. As a whole, establishments classified in this major group may be engaged in the actual mining operations, whether underground auger, culmbank, or strip mining, or some form of preparation for commercial and industrial use. Also classified in this group are firms that mine the coal on a contract basis. In Montana, the coal is now almost entirely extracted through strip mining operations. This method involves highly capital-intensive equipment such as draglines, bulldozers, and other heavy equipment to move the earth away and dig out the coal. This method saves considerable human labor costs, but can be used only where coal seams are near the earth's surface.

EMPLOYMENT TRENDS

Almost everyone is aware of the 20th century rise and fall of the coal mining industry. This precious resource was once used for everything from providing the energy in producing electricity for residential and commercial use to providing the necessary power to run a train. But petroleum and natural gas gradually replaced coal as our nation's energy source. However, because of dwindling reserves in oil and gas products, coal is once again emerging as the potential supplier of our energy needs. In Montana, employment in this industry has grown from about 200 in 1972 to over 750 workers in 1976, a 275% increase in the four year period. With a national push towards energy independence, Montana's coal industry is expected to grow through the rest of this decade, as well as the 1980's. The question remains, what rate of growth will Montana see in the next 10 years? There are many variables precluding an accurate long-term forecast, but at this time, the coal industry is expected

to post a yearly employment average of 1100 to 1200 workers by 1985.

OCCUPATIONAL CHARACTERISTICS

Following the occupational patterns of the other major groups in the mining industry, the maintenance and production category filled the largest number of employees in the coal industry. A total 665 individuals came from occupations in this group. In terms of total employment, workers from maintenance and production occupations accounted for nearly 83% of all workers in the coal industry. Significant occupations in this group include: heavy equipment operators, truck drivers, welders and flamecutters, oilers, mine-machinery mechanics, maintenance foremen, and laborers. Other occupations include managers and officers, mining engineers, and stock clerks, storeroom and warehouse workers.

TABLE IX

TOTAL WAGE AND SALARY EMPLOYMENT
IN THE COAL MINING AND NON-METALLIC - QUARRYING INDUSTRIES

(SIC 12 & 14)

1960 - 1976

YEAR	ANNUAL AVERAGE EMPLOYMENT [1/]
1960	700
1961	700
1962	800
1963	900
1964	900
1965	1,100
1966	1,100
1967	1,000
1968	1,000
1969	800
1970	800
1971	900
1972	1,000
1973	1,200
1974	1,400
1975	1,600
1976	1,600

[1/] All data are rounded to the nearest hundred.

TABLE X

ESTIMATED EMPLOYMENT IN SELECTED OCCUPATIONS IN THE COAL MINING INDUSTRY (BITUMINOUS AND LIGNITE)

(SIC 12)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
TOTAL ALL OCCUPATIONS		805		100.00	
MANAGERS AND OFFICERS		35			
All Other Managers & Officers	19000	35	NA	4.32	100
Research & Development	19000	2	NA	0.24	17
PROFESSIONAL OCCUPATIONS		29			
Mechanical Engineer	21008	1	28.28	0.12	17
Mining Engineer	21010	18	16.23	2.71	67
Safety Engineer	21012	1	28.28	0.12	17
All Other Engineers	21900	6	NA	0.72	17
Research & Development	21900	4	NA	0.49	17
Purchasing Agent	25300	1	28.28	0.12	17
Accountants & Auditors	25401	1	43.58	0.12	17
All Other Professional	29000	1	NA	0.12	17
TECHNICAL OCCUPATIONS		12			
Computer Programmer	31000	4	27.61	0.49	17
Draftsman	32003	4	43.30	0.49	17
Surveyor	32008	3	29.43	0.37	33
All Other Technical	39000	1	NA	0.61	17
SERVICE OCCUPATIONS		3			
Guards & Watchmen	42000	2	27.38	0.24	17
Foreman, Nonworking Supervisor	44014	1	28.28	0.12	17
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING, POWER PLANT, MINING, & PROCESSING OCCUPATIONS		665			
Mechanic, Automotive	51008	16	18.32	1.97	33
Mine Machinery Mechanic	51041	55	6.56	6.79	50
Truck Driver	54000	62	10.47	7.65	67
Blaster	55A21	19	12.49	2.34	67
Carpenter	55A47	9	12.95	1.11	33
Continuous Mining Machine Operator	55A74	4	27.38	0.49	17
Craneman, Derrickman, & Hoistman	55A82	4	27.38	0.49	17

COAL MINING (CONT.)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
MAINTENANCE, ETC., (CONT.)					
Driller, Machine	55B04	16	11.45	1.97	33
Dump Operator	55B07	22	25.10	2.71	17
Electrician	55B12	30	6.83	3.70	50
Foreman, Maintenance	55B29	40	5.03	4.93	67
Heavy Equipment Operator	55B52	216	5.76	26.66	67
Machinist	55B84	1	28.28	0.12	17
All Other Helpers	56900	10	NA	1.23	50
Oiler	55C06	60	12.69	7.40	67
Tipple Operator	55D21	4	27.38	0.49	17
Welders - Flamecutters	55D46	61	10.66	7.53	50
All Other Operatives	59002	1	NA	0.12	17
All Other Laborers	59003	35	NA	4.32	50
CLERICAL OCCUPATIONS		60			
Keypunch Operator	61107	4	27.61	0.49	17
Accounting Clerk	61301	3	27.68	0.37	17
General Clerk	61333	10	10.29	1.23	83
Payroll &/or Timekeeping Clerk	61351	4	27.61	0.49	17
Secretary	61368	11	14.57	1.35	67
Clerical Supervisor	61396	7	23.69	0.86	17
Stock Clerk, Storeroom, & Warehouse	62008	21	9.09	2.59	50
SALES OCCUPATIONS		1			
All Other Salesmen		1	NA	0.12	17

TABLE XI

ESTIMATED EMPLOYMENT BY MAJOR OCCUPATIONAL GROUP

IN THE COAL MINING INDUSTRY

(SIC 12)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
Major Occupational Group		
TOTAL ALL OCCUPATIONS	805 1/	100.00
MANAGERS AND OFFICERS	35	4.32
PROFESSIONAL OCCUPATIONS	29	3.60
TECHNICAL OCCUPATIONS	12	1.49
SERVICE OCCUPATIONS	*	*
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING, AND POWER PLANT OCCUPATIONS	665	82.61
CLERICAL OCCUPATIONS	60	7.45
SALES OCCUPATIONS	*	*

1/ Occupational totals are rounded and may not add to the total.

* Employment is less than 5 people.

TABLE XII

ESTIMATED EMPLOYMENT IN MAJOR SPECIFIC OCCUPATIONS

IN THE COAL MINING INDUSTRY

(SIC 12)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
HEAVY EQUIPMENT OPERATOR	216	26.66
TRUCK DRIVER	62	7.65
WELDERS AND FLAMECUTTER	61	7.53
OILER	60	7.40
MINE MACHINERY MECHANIC	55	6.79
FOREMAN MAINTENANCE	40	4.93
ALL OTHER LABORERS	35	4.32
TOTAL	529	65.28%
TOTAL ALL OCCUPATIONS	805	100.00%

THE NON-METALLIC MINING AND QUARRYING INDUSTRY

(SIC 14)

THE REPORT ON EMPLOYMENT IN THE NON-METAL MINING AND QUARRYING INDUSTRY

INDUSTRY CHARACTERISTICS

Industry 14 includes establishments engaged in exploring and mining of non-metallic minerals; as well as the preparation of minerals through crushing, grinding, washing and other processes readying the materials for selling.

Within this industry, there are seven minor categories which include:

(1) (SIC 141) The mining or quarrying a dimension stone, examples in this category are granite, limestone, greenstone, marble, slate, travertine, onyx, etc.

(2) (SIC 142) This group includes firms mining or quarrying crushed rocks, such as cement rock, limestone, travertine, granite, slate, sandstone, and marble. This is very similar to the previous group, except that the minerals are already crushed or broken; instead of cutting the stone to dimensions.

(3) (SIC 144) Establishments engaged in the operation of sand and gravel pits and the processing of the minerals for construction use.

(4) (SIC 145) This group encompasses the mining, milling and preparing of clay, stoneware, fluorspar, topaz, and other refractory minerals.

(5) (SIC 147) Chemical and fertilizer mineral mining, milling and preparing, such as barite, fluorspar, potash, soda, phosphate, rock salt, sulfur and others.

(6) (SIC 148) This group included firms engaged in mining for non-metallic minerals for a contract fee. This may involve strip mining operations with heavy equipment, drilling operations, mine development, exploration, and other non-metallic mining services.

(7) (SIC 149) This group entails the mining of miscellaneous non-metallic minerals, an important facet of mining activity in Montana. This category includes gypsum, talc, and vermiculite.

OCCUPATIONAL CHARACTERISTICS

In the month the survey was conducted, August 1976, there were 854 individuals employed in the non-metallic mining and quarrying industry. Among the major occupational groups, the maintenance, construction and production category accounted for the largest percentage with about 720 or nearly 85% of all workers in the industry. This group was followed by managers and officers with 60 employees, 7% of all occupations. The clerical, professional, and technical categories accounted for about 4%,

3%, and 1%, respectively, of the industry's total employment.

In regard to specific occupations, six of the seven largest occupations fell in the maintenance and production group. In an industry largely concerned with the mining of minerals and operating gravel pits, dump trucks and heavy equipment are very important. For this reason, it is not surprising that truck drivers were the largest specific occupational group, with 160 or 18% of the total employment, followed by heavy equipment operators, with an estimated 100 workers. In the maintenance and production group, hand drillers and mill and grinder operators accounted for the next largest percentage of workers.

Other significant specific occupations in the non-metallic mining industry include: automotive mechanics, carpenters, maintenance foremen, helper trades, separation tenders, and in the management group, managers and officers.

TABLE XIII

ESTIMATED EMPLOYMENT IN SELECTED OCCUPATIONS IN THE NON-METALLIC MINING AND QUARRYING INDUSTRY

(SIC 14)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
TOTAL ALL OCCUPATIONS		854		100.00	
MANAGERS AND OFFICERS		61			
All Other Managers and Officers	19000	61	NA	7.11	83
Research and Development	19000	3	NA	0.35	17
PROFESSIONAL OCCUPATIONS		22			
Civil Engineer	21004	2	11.18	0.23	17
Mechanical Engineer	21008	4	18.54	0.46	8
Metallurgist & Metallurgical Engineer	21009	4	18.54	0.46	8
Mining Engineer	21010	2	25.49	0.23	8
Safety Engineer	21012	2	11.18	0.23	17
Geologists & Geophysicists	22202	3	7.45	0.35	25
Purchasing Agent	25300	3	14.52	0.35	25
All Other Professional	29000	2	NA	0.23	17
TECHNICAL OCCUPATIONS		10			
Surveyor	32008	3	17.63	0.35	17
All Other Engineering Technicians	32900	2	NA	0.23	17
All Other Technical	39000	5	NA	0.58	8
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING, POWER-PLANT, MINING, AND PROCESSING OCCUPATIONS		724			
Mechanic, Automotive	51008	28	13.76	3.26	42
Mine Machinery Mechanic	51041	5	19.89	0.58	17
All Other Mechanics	51900	10	NA	1.16	17
Truck Driver	54000	161	10.09	18.78	83
Blaster	55A21	1	17.32	0.11	8
Carpenter	55A47	19	10.21	2.21	17
Craneman, Derrickman, & Hoistman	55A82	7	20.15	0.81	17
Drier Operator	55B02	4	25.37	0.46	8
Driller, Hand	55B03	56	23.62	6.53	8
Driller, Machine	55B04	9	34.24	1.05	25
Electrician	55B12	14	13.05	1.63	17

NON-METALLIC MINING & QUARRYING
(CONT.)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
MAINTENANCE, ETC., (CONT.)					
Foreman, Maintenance	55B29	27	9.12	3.15	42
Heavy Equipment Operator	55B52	101	14.98	11.78	58
Industrial Truck Operator	55B57	12	18.42	1.40	25
Loading Machine Operator	55B78	4	18.54	0.46	8
Machinist	55B84	2	18.70	0.23	8
Maintenance, Repairer, General Utility	55B86	10	26.53	1.16	25
All Other Helper Trades	56900	46	NA	5.36	25
Motorman, Industrial	55B98	12	22.88	1.40	8
Stationary Boiler, Firerer	55C90	1	17.32	0.11	8
Stationary Engineer	55C91	1	24.49	0.11	8
Welders & Flamecutters	55D45	15	14.25	1.75	33
Sawyer, Stone	55N65	1	24.49	0.11	8
Separation Tender	55R62	28	24.48	3.26	8
Mill & or Grinder Operator	55S98	54	17.36	6.30	42
All Other Skilled Craftsman	59001	47	NA	5.36	17
All Other Operatives	59002	14	NA	1.62	17
All Other Laborers	59003	35	NA	4.08	25
CLERICAL OCCUPATIONS		37			
Accounting Clerk	61301	2	11.18	0.23	17
Bookkeeper, Hand	61307	11	26.58	1.28	33
General Clerk	61333	6	29.90	0.70	25
Payroll & or Timekeeping Clerk	61351	2	11.18	0.23	17
Secretary	61368	7	43.14	0.81	33
Clerical Supervisor	61396	1	17.32	0.11	8
All Other Office Clerical Workers	61900	1	NA	0.11	8
Production Clerk	62003	2	11.18	0.23	17
Stock Clerk, Storeroom, & Warehouse	62008	5	18.43	0.58	8

TABLE XIV

ESTIMATED EMPLOYMENT BY MAJOR OCCUPATIONAL GROUP

IN THE NON-METAL MINING AND QUARRYING INDUSTRY

(SIC 14)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
TOTAL ALL OCCUPATIONS	850 1/	100.0
MANAGERS AND OFFICERS	60	7.1
PROFESSIONAL OCCUPATIONS	20	2.6
TECHNICAL OCCUPATIONS	10	1.2
SERVICE OCCUPATIONS	*	*
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING AND POWER PLANT OCCUPATIONS	720	84.8
CLERICAL OCCUPATIONS	40	4.3
SALES OCCUPATIONS	*	*

1/ Occupational totals are rounded and may not add to the total.
* Employment is less than 5 people.

TABLE XV

ESTIMATED EMPLOYMENT IN MAJOR SPECIFIC OCCUPATIONS

IN THE NON-METAL MINING AND QUARRYING INDUSTRY

(SIC 14)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
TRUCK DRIVER	161	18.78
HEAVY EQUIPMENT OPERATOR	101	11.78
MANAGERS AND OFFICERS	61	7.11
DRILLER, HAND	56	6.53
MILL and/or GRINDER OPERATOR	54	6.30
ALL OTHER SKILLED CRAFTSMEN	46	5.36
ALL OTHER LABORERS	35	4.08
TOTAL	514	59.94
TOTAL ALL OCCUPATIONS	854	100.00%

THE CRUDE PETROLEUM AND NATURAL GAS EXTRACTION INDUSTRY

(SIC 13)

THE REPORT ON EMPLOYMENT IN THE CRUDE PETROLEUM AND NATURAL GAS INDUSTRY

INDUSTRY CHARACTERISTICS

The crude petroleum and natural gas industry, as classified in Standard Industrial Classification Manual, 1972, consists of establishments engaged in the following:

[1] (1) producing crude petroleum and natural gas,
(2) recovering oil from oil sands and oil shale, and
(3) producing natural gasoline and cycle condensate.

Within this industry, there are three major groups. Crude petroleum and natural gas, (SIC 131), envelopes establishments engaged in exploration for oil and gas, well drilling and the overall operation of the wells, while the recovery of natural liquified gases, such as butane, propane, etc., is classified in SIC 132. Firms dealing in specialized services within the industry are classified in SIC 138. This includes contract drilling for oil and gas wells, geological and geophysical services, seismograph surveys, oil and gas well building and repairing, oil sampling and testing services, and other special services for the successful operation and maintenance of oil field wells and equipment.

NOTE: Petroleum refining, pipeline transportation of crude oil and natural gas, and the distribution of refined petroleum products are not classified in this industrial group.

EMPLOYMENT TRENDS

Since 1960, average annual employment in the oil and gas industry has ranged from a low of 1600 in 1971 to an employment high of 2300 in 1969. Although this represents an employment range of about 700 employees, the actual year to year variance was fairly small in comparison with other industrial groups.

[1] Standard Industrial Classification Manual, 1972; Executive office of the President, office of Management on Budget, U.S. Government Printing Office, Page 37.

EMPLOYMENT TRENDS (CONT.)

In fact, during the 17 year period, employment averaged about 1900 people.

In August, 1976, an estimated 1900 workers were employed in some facet of the oil and natural gas extraction industry in Montana. This represents less than one percent of the 200,000 oil and gas workers in the United States.

OCCUPATIONAL CHARACTERISTICS

Of the estimated 1900 oil and gas industry workers employed in Montana during the survey month of August, 1976, 180 or 9.7% were managers and officers. Those employed in professional positions totaled about 130 workers, with the geologists and geophysicists, petroleum engineers, and accountants and auditors, making up nearly 83% of the total employment in the professional category. Less than one percent were employed in technical positions: draftsmen, computer programmers, surveyors, etc.

The largest percentage of oil and gas workers were employed in maintenance and production occupations. In fact, a total of 1350, or 71.5% of all workers, were employed in this major occupational category. Of these, 126 were truck drivers; 91 - derrickmen, petroleum; 481 - rotary drill operators and helpers; and 270 were employed as roustabouts.

Among the 180 clerical workers, all but 13 were office clerical workers and about 45% were secretaries. This major occupational category accounted for just under 10% of all employees in the industry.

TABLE XVI

TOTAL WAGE AND SALARY EMPLOYMENT
IN THE CRUDE PETROLEUM AND NATURAL GAS EXTRACTION INDUSTRY

(SIC 13)

1960 - 1976

YEAR	ANNUAL AVERAGE EMPLOYMENT [1/]
1960	2,200
1961	2,000
1962	2,200
1963	2,100
1964	1,900
1965	1,800
1966	1,700
1967	1,700
1968	2,200
1969	2,300
1970	1,800
1971	1,600
1972	1,700
1973	1,600
1974	2,000
1975	2,000
1976	2,200

[1/] All data are rounded to the nearest hundred.

TABLE XVII

ESTIMATED EMPLOYMENT IN SELECTED OCCUPATIONS IN THE CRUDE PETROLEUM AND NATURAL GAS EXTRACTION INDUSTRY

(SIC 13)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
TOTAL ALL OCCUPATIONS		1898		100.00	
MANAGERS AND OFFICERS		184			
All Other Managers & Officers	19000	184	12.17	9.71	77
PROFESSIONAL OCCUPATIONS		127			
Petroleum Engineer	21011	41	34.21	2.16	16
All Other Engineers	21900	11	NA	0.57	5
Geologists & Geophysicists	22202	37	32.09	1.95	16
All Other Physical Scientists	22299	2	NA	0.10	*
Accountants & Auditors	25401	27	33.59	1.42	16
Personnel & Labor Relations	25465	2	0.00	0.10	*
All Other Professional Workers	29000	7	NA	0.35	7
TECHNICAL OCCUPATIONS		36			
All Other Science Technicians	33900	13	NA	0.66	*
All Other Engineering Technicians	32900	9	NA	0.46	NA
All Other Technicians	39000	14	NA	0.73	9
SERVICE OCCUPATIONS		11			
All Other Janitors, Porters, & Cleaners	41900	7	NA	0.37	7
All Other Service Workers	44014	4	NA	0.21	5
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING, & POWER PLANT OCCUPATIONS		1355			
Mechanic, Automotive	51008	33	30.22	1.74	5
All Other Mechanics & Repairmen	51900	16	NA	0.84	5
Truck Driver	54000	126	28.02	6.65	33
Derrickman, Petroleum	55A88	91	24.21	4.85	19
Foreman, Maintenance	55B29	41	22.51	2.16	28
Heavy Equipment Operator	55B52	46	40.68	2.42	9

CRUDE PETROLEUM AND GAS INDUSTRY
(CONT.)

OCCUPATIONAL TITLE	OES CODE	ESTIMATED EMPLOYMENT	RELATIVE ERROR %	PERCENT DISTRIBUTION	PERCENT OF ESTABLISHMENTS REPORTING THE OCCUPATION
MAINTENANCE, ETC., (CONT.)					
Rotary Drill Operator	55C59	174	17.05	9.18	30
Rotary Drill Helper	55C60	307	22.91	16.20	21
All Other Helper Trades	56900	20	NA	1.05	*
Roustabout	55C61	270	22.64	14.25	35
Technical Operator	55D10	19	43.14	1.00	12
Welders & Flamecutters	55D46	13	40.69	0.68	12
Well Puller	55D47	30	42.94	1.58	9
All Other Skilled Craftsmen	59001	90	NA	4.74	NA
All Other Operatives	59002	39	NA	2.05	NA
All Other Laborers	59003	40	NA	2.11	NA
CLERICAL OCCUPATIONS		181			
Accounting Clerk	61301	12	36.66	0.63	12
Bookkeeper, Hand	61307	18	31.35	0.95	12
Receptionist	61361	12	35.08	0.63	14
Secretary	61368	82	25.62	4.32	33
All Other Office Clerical	61900	44	NA	2.32	
All Other Plant Clerical	62900	13	NA	0.69	7
SALES OCCUPATIONS		4			
All Other Salesmen	71900	4	NA	0.21	*

TABLE XVIII

ESTIMATED EMPLOYMENT BY MAJOR OCCUPATIONAL GROUP

IN THE CRUDE PETROLEUM AND NATURAL GAS

EXTRACTION INDUSTRY

(SIC 13)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
TOTAL ALL OCCUPATIONS	1900[1/]	100.0
MANAGERS AND OFFICERS	180	9.7
PROFESSIONAL OCCUPATIONS	130	6.7
TECHNICAL OCCUPATIONS	40	1.9
SERVICE OCCUPATIONS	10	.6
MAINTENANCE, CONSTRUCTION, REPAIR, MATERIAL HANDLING AND POWER PLANT OCCUPATIONS	1350	71.5
CLERICAL OCCUPATIONS	180	9.5
SALES OCCUPATIONS	*	.2

1/ Occupational totals are rounded and may not add to the total.

* Employment is less than 5 people.

TABLE XIX

ESTIMATED EMPLOYMENT IN MAJOR SPECIFIC OCCUPATIONS

IN THE CRUDE PETROLEUM AND NATURAL GAS EXTRACTION INDUSTRY

(SIC 13)

OCCUPATIONAL TITLE	ESTIMATED EMPLOYMENT	PERCENT OF TOTAL
ROTARY DRILL HELPER	307	16.2
ROUSTABOUT	270	14.2
OTHER MANAGERS AND OFFICERS	184	9.7
ROTARY DRILL OPERATOR	174	9.2
TRUCK DRIVERS	126	6.6
DERRICKMAN, PETROLEUM	91	4.8
SECRETARY	82	4.3
HEAVY EQUIPMENT OPERATOR	46	2.4
ALL OTHER CLERICAL WORKERS	44	2.3
FOREMAN, MAINTENANCE	41	2.2
PETROLEUM ENGINEER	41	2.2
ALL OTHER LABORERS	40	2.1
TOTAL	1446	76.2%
TOTAL ALL OCCUPATIONS	1898	100.0%

APPENDIX

DEFINITIONS OF SELECTED OCCUPATIONS IN THE MINING INDUSTRY

BLASTER, MINING AND QUARRYING: Determines patterns of explosives required and charges, tamps, and sets off explosives in underground or surface mine, pit, or quarry to break and loosen ore, coal, or rock from solid formations.

BRATTICEMAN: Builds doors or brattices (ventilation walls or partitions) in underground passageways to control the proper circulation of air through the passageways and to the working places.

CRANEMEN/DERRICKMEN AND HOISTMAN: Operate various kinds or cranes and hoists to lift, move, and load materials, machines, and products.

DISPATCHER, MINECAR: Controls or keeps track of the traffic on haulageways and informs underground workers by telephone or track signals when to move trains or locomotives.

DREDGE OPERATOR: Operates power-driven dredge to mine sand and gravel at the bottom of lakes, rivers, and streams.

DRIER OPERATOR, COAL OR ORE: Controls one or more of several types of furnaces or kilns, and driers or auxiliary equipment to dry coal or ore before or after washing, milling, or pelletizing.

DRILLER, HAND: Drills holes in specified pattern and location in ore, earth, or rock to facilitate planting of explosives.

DRILLER, MACHINE: Sets up and operates drilling machine (truck mounted, etc.) to bore or burn out blasting holes. Includes workers who operate drilling equipment to obtain samples of strata for analysis of geological character of ground, nature of ore, strength of foundation material, etc.

DUMP OPERATOR: Tends mechanical or electrical dumping equipment to dump materials, such as raw coal or ore, from mine cars, railroad cars, or trucks into bins or onto conveyor for storage, reloading, or further processing.

ENGINEER: Include persons concerned with practical application of physical laws and principles of engineering for the development and utilization of machines, materials, instruments, processes, and services. Count as engineers all persons actually engaged in chemical, civil, electrical, mechanical, metallurgical, or any other type of engineering work at a level which requires knowledge of engineering.

GEOLOGISTS AND GEOPHYSICISTS: Geologist: Studies composition, structure, and history of the earth's crust. Examines rocks, minerals, and fossil remains to identify and determine sequence of processes affecting development of earth. Applies knowledge of chemistry, physics, biology, and mathematics to explain these phenomena and to help locate mineral and petroleum deposits and underground water resources. Geophysicist: Studies physical aspects of earth, including its atmosphere and hydrosphere. Investigates and measures seismic, gravitational, electrical, thermal, and magnetic forces affecting earth.

LAMPMAN: Cleans, tests, repairs or otherwise maintains electric lamps and safety lamps used underground by miners.

LOADING MACHINE OPERATOR. (UNDERGROUND): Operates underground loading machine to load coal, ore, or rock into shuttle or mine car or onto conveyors. Loading equipment may include any of various types, such as power shovel, hoisting engine equipped with cable-drawn scraper or scoop, or machine equipped with gathering arms and conveyor.

MACHINIST: Sets up and operates machine tools and fits and assembles parts to make or repair metal parts, mechanisms, tools or machines of an establishment applying knowledge of mechanics, shop mathematics, metal properties, and layout machining procedures.

MILL AND/OR GRINDER OPERATOR, MINERALS: Tends or operates equipment such as grinding mills and crushers that grind, pulverize, compress or otherwise reduce minerals (e.g., rock, ore, coal, salt, clay and glass) to smaller sizes.

MINE MACHINERY MECHANIC: Repairs, adjusts, and maintains mining machinery, such as stripping and loading shovels, drilling and cutting machines, continuous mining machines, and mine cars.

MOTORMAN, INDUSTRIAL: Controls dinkey engine powered by electric, gasoline, steam, compressed air, or diesel engine to transport and shunt cars at industrial establishment or mine.

OILER: Oils and greases moving parts of friction surfaces of mechanical equipment, such as shaft and moving bearings, sprockets, drive chains, gears, and pulleys, according to specified procedures and oral instructions.

PANELBOARD OPERATOR: Operates panelboard to control machinery and equipment such as conveyors, blenders, vibrating feeders, crushers, rod and ball mills, sizers, separators, washers, distributors, and pumps to grind, separate or otherwise prepare coal, rock, or ore for further processing or for commercial or industrial use.

PUMPMAN: Tends one or more power driven pumps to transfer liquids, semi-liquids, gaseous or powdered materials from one vessel or process to another.

REPAIRMAN, BELT: Repairs and replaces canvas, leather, or rubber belts used to drive machinery or convey materials.

ROTARY DRILL OPERATOR: Operates permanent or portable gasoline, diesel, electric or steam draw works to drill oil or gas wells. May also drill shallow boreholes to obtain samples of earth formations for placement of explosives in seismic prospecting, or to discover petroleum.

ROUSTABOUT: Assembles and repairs oilfield equipment, using handtools and power tools. Performs other tasks as needed.

SAWYER, STONE: Sets up and operates saws to cut blocks of stone into specified dimensions.

SEPARATION TENDER: Tends or operates one or more devices, such as jigs, cones, and battery of spirals, that separate impurities from coal, ore and other minerals.

SHAKER TENDER: Tends shaker (vibrating or reciprocating screen) that sizes crushed coal, ore, or rock for industrial use or for further processing.

STATIONARY BOILER, FIRER: Fires stationary boilers that supply heat, power, or steam to an establishment. May be required to hold license issued by State or municipality.

STATIONARY ENGINEER: Operates and maintains stationary engines and mechanical equipment, such as steam engines, air compressors, generators, motors, turbines, and steam boilers, to provide utilities, such as light, heat, or power for buildings and industrial processes.

TECHNICAL OPERATOR, OIL AND GAS: Charts pressure, temperature, and other characteristics of oil and gas well boreholes or producing wells, using special subsurface instruments, and interprets findings for use in determining further drilling or producing procedures.

TIPPLE OPERATOR: Operates engines or motors that drive conveyors, shaking screens, and other machinery in a tipple where coal or ore is prepared for market.

WELL PULLER: Controls power hoisting equipment to pull casing, tubing and pumping rods from oil and gas wells for repair and to lower repaired equipment, testing devices, and servicing tools into well.

TABLE XX

MONTANA HOURS AND EARNINGS

For The Mining Industry

1970 - JANUARY 1977

	AVERAGE WEEKLY EARNINGS		AVERAGE WEEKLY HOURS		AVERAGE HOURLY EARNINGS	
	Mining	Metal Mining	Mining	Metal Mining	Mining	Metal Mining
1970	158.59	159.39	41.3	41.4	3.84	3.85
1971	169.81	170.96	43.1	43.5	3.94	3.93
1972	187.65	190.85	41.7	41.4	4.50	4.61
1973	198.58	198.19	41.2	40.2	4.82	4.93
1974	237.73	239.44	42.3	41.0	5.62	5.84
1975	272.[illegible]	271.42	43.1	41.0	6.33	6.62
1976	304.56	301.07	43.2	41.7	7.05	7.22
January 1977	321.70	318.10	43.1	42.3	7.58	7.52

TABLE XXI

MONTANA JOB OPENINGS AND LABOR TURNOVER STATISTICS

For The Mining Industry

1972 - 1976

(Per 100 Employees by Calendar Year)

MINING

	1972	1973	1974	1975	1976
Total Accessions	4.8	6.0	4.5	3.1	2.6
New Hires	3.1	3.2	2.5	1.8	1.2
Total Separations	4.4	6.0	4.9	4.5	3.1
Quits	2.4	3.0	2.2	1.6	0.8
Layoffs	0.3	0.2	0.5	1.4	1.5

METAL MINING

	1972	1973	1974	1975	1976
Total Accessions	5.3	6.5	4.0	1.3	1.7
New Hires	2.7	2.2	1.2	0.0	0.1
Total Separations	5.3	6.8	4.9	4.9	1.8
Quits	2.6	2.8	2.0	0.4	0.2
Layoffs	0.3	0.2	0.4	2.5	0.4

TABLE XXII

Mineral Production in Montana [1]

Mineral	1972 Quantity	1972 Value (Thousands)	1973 Quantity	1973 Value (Thousands)
Clays[2] ----- thousand short tons---	304	$1,590	219	$1,298
Coal(bituminous)--thousand short tons (dollars)[3]	8,221	16,690	10,725	30,238
Copper (recoverable content of ores, etc.) Short tons--------	123,110	126,064	132,466	157,634
Gem stones----------	NA	120	NA	150
Gold (recoverable content of ores, etc.) troy ounces----------	23,725	1,390	27,806	2,720
Iron ore (usable) thousand long tons, gross weight----------	9	W	13	W
Lead (recoverable content of ores, etc.) short tons----------	287	86	176	57
Lime---thousand short tons------	242	3,003	210	3,028
Manganese ore and concentrate (35% or more Mn) Short tons, gross weight	578	W	239	W
Natural gas--million cubic feet--	33,474	4,117	56,175	13,240
Peat----thousand short tons------	1	W	1	W
Petroleum (crude)----thousand 42-gallon barrels	33,904	103,924	34,620	115,423
Sand and gravel----thousand short tons	10,116	17,149	11,694	13,819
Silver (recoverable content of ores, etc.)--thousand troy ounces-------	3,325	5,603	4,350	11,127
Stone---thousand short tons-------	4,074	5,627	5,054	9,559
Zinc (recoverable content of ores, etc.)---------short tons----------	12	4	73	30
Value of items that cannot be disclosed: Antimony, cement, fire clay, fluorspar, gypsum, natural gas liquids, phosphate rock, talc, tungsten, vermiculite, and values indicated by symbol W	XX	$22,309	XX	$26,962
Total----------	XX	307,676	XX	385,285
Total 1967 constant dollars----------	XX	253,863	XX	P 282,876

Scource: U.S. Department of the Interior, Bureau of Mines, "The Mineral Industry of Montana," Minerals Yearbook, Area Reports; Domestic, Vol. II (Washinton,D.C.: U.S. Government Printing office, 1976), table 1, pp. 417-418.

P-Preliminary. NA-Not avialable. W-Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX-Not applicable.

1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2 Excludes fire clay; included with "Value of items that cannot be disclosed."

3 Exception, bituminous coal valuation in dollars.

TABLE XXIII

Value of mineral production in Montana by county [1]

County	1972	1973	Minerals produced in 1973 in order of value
Beaverhead	W	W	Stone, silver, sand and gravel, zinc, lead, gold, copper.
Big Horn	W	W	Coal, sand and gravel, petroleum, natural gas, stone.
Blaine	$289	$290	Petroleum.
Broadwater	W	W	Iron ore, sand and gravel, stone.
Carbon	5,225	W	Petroleum, sand and gravel, natural gas, stone.
Carter	W	W	Clays, sand and gravel, Petroleum.
Cascade	188	W	Sand and gravel, clays, stone.
Choteau	W	535	Sand and gravel, stone.
Custer	W	W	Sand and gravel, natural gas, stone.
Daniels	32	58	Sand and gravel, petroleum.
Dawson	W	2,366	Petroleum, sand and gravel, stone.
Deer Lodge	3,768	3,603	Lime, stone, sand and gravel, clays silver, copper,gold.
Fallon	22,986	22,876	Petroleum, natural gas liquids.
Fergus	W	W	Gypsum, sand and gravel, clays, stone.
Flathead	491	1,142	Sand and gravel, silver, stone, lead, copper, gold,zinc.
Gallatin	W	8,537	Cement, sand and gravel, stone, clays.
Garfield	1,069		
Glacier	2,314	2,324	Petroleum, natural gas liquids, sand and gravel.
Golden Valley	7	30	Sand and gravel.
Granite	W	W	Silver, gold, copper, tungsten, stone, zinc, lead.
Hill	W	207	Sand and gravel.
Jefferson	5,815	W	Cement , stone, gold, sand and gravel, silver, copper, lead, zinc, clays.
Judith Basin		24	Stone.
Lake	W	W	Sand and gravel, peat.
Lewis & Clark	257	223	Sand and gravel, copper, silver, lead, gold, zinc, stone.
Liberty	1,167	1,152	Petroleum, sand and gravel.
Lincoln	5,483	W	Vermiculite, stone, sand and gravel.
McCone	2,101	1,420	Petroleum, sand and gravel.
Madison	W	W	Talc, sand and gravel, gold, silver, copper, zinc, lead, stone.
Meagher	30	168	Stone, gold.
Mineral	1,392	355	Stone, copper, sand and gravel, gold silver, lead.
Missoula	W	W	Sand and gravel, stone.

County	1972	1973	Minerals produced in 1973 in order of Value
Musselshell	3,689	W	Petroleum, coal, clays.
Park	W	W	Sand and gravel, stone.
Petroleum	101	6	Sand and gravel.
Phillips	14	15	Clays.
Pondera	419	47	Petroleum, sand and gravel.
Powder River	20,193	30,011	Petroleum,sand and gravel, natural gas, coal, stone.
Powell	W	W	Phosphate rock, sand and gravel, stone, silver, copper, zinc, lead, gold.
Ravalli	W	W	Fluorspar, sand and gravel, stone.
Richland	8,707	8,297	Petroleum, coal, sand and gravel, natural gas liquids, lime, stone.
Roosevelt	W	W	Petroleum, natural gas liquids, sand and gravel.
Rosebud	16,920	17,013	Coal, petroleum,sand and gravel, clays.
Sanders	W	324	Antimony, sand and gravel, stone.
Sheridan	W	6,565	Petroleum, sand and gravel.
Silver Bow	133,264	171,062	Copper, silver, gold, sand and gravel,stone, manganese.
Stillwater	64	1	Stone.
Sweet Grass	W	65	Sand and gravel, stone.
Teton	W	39	Sand and gravel, petroleum.
Toole	3,001	W	Petroleum, sand and gravel.
Treasure	W	W	Clays.
Valley	W	W	Sand and gravel.
Wheatland		50	Do.
Wibaux	W	8	Do.
Yellowstone	1,388	1,374	Sand and gravel, lime, petroleum, clays, stone.
Yellowstone Nat'l Park	576	1,196	Sand and gravel,
Combined Counties[2]	27,081	37,530	
Undistributed[3]	39,639	66,372	
Total[4]	307,676	385,285	

Source: U.S. Department of the Interior, Bureau of Mines, "The Mineral Industry of Montana," Minerals Yearbook, Area Reports; Domestic, Vol II (Washington, D.C.: U.S. Government Printing Office, 1976) Table 2, pp. 418-419.

1 Prairie County is not listed because no production was reported.
2 Petroleum and natural gas production from fields underlying two or more counties.
3 Includes mineral production which cannot be assigned to specific counties and values indicated by symbol W.
4 Data may not add to totals shown because of independent rounding.

W-Withheld to avoid disclosing individual company confidential data; included with "undistributed."

TABLE XXIV

MONTANA

State Ranking in Terms of Mineral Extraction

1973

Minerals	Rank
Antimony Ore	2
Copper	4
Coal	15
Fluorspar	3
Gold	9
Gypsum	12
Iron Ore	11
Lead	10
Manganese Ore	1
Natural Gas	20
Natural Gas Liquids	16
Peat	14
Petroleum,Crude	18
Phosphate Rock	6
Silver	3
Talc, Soapstone, Pyrophyllite	4
Tungsten	6
Vermiculite	1
Zinc	11

Source: U.S. Department of the Interior, Bureau of Mines, "The Mineral Industry of Montana," Minerals Yearbook, Area Reports; Domestic, Vol. II (Washington, D.C.: U.S. Government Printing Office, 1976) Table 3, Page 6.

TABLE XXV

SUMMARY OF DRILLING BY COUNTIES - 1975

STATE OF MONTANA

County	Wildcats			Development			Total Wells	Footage Drilled	Average Depth
	Dry	Oil	Gas	Dry	Oil	Gas			
Beaverhead	1	0	0	0	0	0	1	13,909	13,909
Big Horn	7	0	0	1	3	1	12	35,987	2,999
Blaine	30	0	1	36	1	24	92	188,739	2,052
Carbon	6	0	0	5	0	4	15	80,206	5,347
Carter	7	0	0	0	1	0	8	16,157	2,020
Chouteau	2	0	0	9	0	2	13	15,877	1,221
Custer	2	0	0	0	0	1	3	6,658	2,219
Daniels	3	0	0	0	0	0	3	24,277	8,092
Dawson	6	0	0	1	1	0	8	71,245	8,906
Fallon	1	0	0	2	7	0	10	92,776	9,278
Fergus	11	0	0	10	0	6	27	57,378	2,125
Garfield	1	0	0	0	0	0	1	2,202	2,202
Glacier	3	0	0	7	12	3	25	73,736	2,949
Golden Valley	8	0	1	0	0	0	9	27,538	3,060
Granite	2	0	0	0	0	0	2	2,534	1,267
Hill	16	0	3	62	0	36	117	186,227	1,592
Liberty	4	0	2	14	8	24	52	134,481	2,586
McCone	4	1	0	2	3	0	10	66,264	6,624
Musselshell	14	1	0	11	9	0	35	128,369	3,668
Petroleum	10	0	0	0	1	0	11	34,290	3,117
Phillips	10	0	1	6	0	119	136	206,251	1,517
Pondera	2	0	2	6	7	9	26	48,381	1,861
Powder River	1	0	0	2	4	0	7	32,442	4,635
Richland	4	0	0	2	8	0	14	167,908	11,993
Roosevelt	7	1	0	0	7	0	15	125,380	8,359
Rosebud	16	2	0	14	11	0	43	206,022	4,791
Sheridan	7	0	0	1	2	0	10	82,625	8,263
Stillwater	3	0	0	8	0	13	24	45,368	1,890
Sweetgrass	5	0	1	0	0	0	6	23,265	3,878
Teton	10	0	0	3	7	0	20	49,081	2,454
Toole	16	0	4	15	12	19	66	137,993	2,091
Valley	10	0	0	4	0	0	14	47,194	3,371
Wibaux	1	1	0	1	0	0	3	20,440	6,813
Yellowstone	6	0	0	0	1	0	7	16,638	2,377
TOTALS	236	6	15	222	195	261	845	2,467,838	2,921

Source: Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, Annual Review for the year 1975, Relating to Oil and Gas. Vol. 19, page 2.

METHODOLOGY

A. OES SAMPLE DESIGN

The sample used in the OES survey represented a number of firms selected from a universe consisting of all the mining industry establishments covered under Montana's Unemployment Insurance Law. The sample selected from the universe was stratified into four groups: Metal Mining, Coal Mining, Non-Metal Mining and Quarrying, and Crude Petroleum and Natural Gas Extraction. Each stratum was then classified into nine cells based on employment levels by firm. The sampling ratio was selected with respect to the employment totals in each size cell. For large size cells, which had fewer establishments, the proportionate sample ratio was smaller; for small size cells, which had more establishments, the proportionate sampling ratio was larger. Altogether over eighty-five percent of the total employment in the Mining Industry was covered.

B. SURVEY CORRESPONDENCE

1. Interviews were conducted via mail, telephone, and personal visits by Local Office personnel. Each establishment selected in the sample received a detailed survey form. Each survey form listed questions concerning employment levels, job titles, and job descriptions. The various job descriptions were prepared by the Bureau of Labor Statistics and were tested by occupational analysis field centers of the Employment and Training Administration, assuring accurate classifications of job descriptions. Also, to assure occupational homogeneity, the surveyed firms were separated into the four major groups within the mining division. Further, to assure consistency in the data, establishments in the survey were asked to use the month of August as the survey month.

2. The OES Mining Industry survey contained seven occupational categories:

   1) Managers and Officers
   2) Professional Occupations
   3) Technical Occupations

4) Service Occupations

5) Maintenance, Construction, Repair, Material Handling and Powerplant Occupations.

6) Clerical Occupations

7) Sales Occupations

3. Occupational Classification

The occupational classification system used in this OES program assumes a compromise classification between the 417 job titles from the Bureau of the Census and over 21,741 job titles from the Dictionary of Occupational Titles (DOT). By using both sources, this more flexible OES structure has the capability of taking advantage of some of the broad socio-economic characteristics of the Bureau of the Census and at the same time preserving the ability to provide DOT job definitions for Manpower training and Analysis. Various occupations have been classified in the "all other" residual categories, because 1) only minimal on-the-job training was required, or 2) these occupations did not have significant numbers of employees. However, great care was exercised to insure the availability of specific employment figures for occupations which require significant amounts of education and/or training.

4. Survey Processing and Screening

After data was collected, corrections were made, data was thoroughly screened, and final editing procedures were used to produce a "clean data file". The resulting clean data file is used to produce the occupational employment estimate for the four industry groups in the Mining Industry group. The estimating process uses ratio estimates and a series of weighting factors dependent upon the size cell of an establishment. For example, if the sampling ratio, or probability, of sample selection is one out of every five establishments, then the sample weight is five. This result is thus called the weighted reported occupational employment. The ratio for each size class is computed from summed weighted reported data and then this ratio is multiplied by the occupational employment as of the reference date. Accurate and reliable computed ratios are extremely important for obtaining precise estimates for employment patterns.

After the employment estimates are calculated for each of the size cells, the results are summed to produce occupational estimates for each industry.

5. Reliability and Accuracy of Occupational Employment Estimates

Precision of statistical data is an essential criteria for manpower education and training to successfully analyze these estimates. To optimize precision, the following types of errors must be minimized:

a) Non-sampling errors - these are errors that arise from faulty responses to survey questionnaires, physical errors in processing surveys, inaccurately furnished data, and inadequate planning and data collecting. Great care in obtaining a "clean data file" has minimized non-sampling errors in the mining industry survey.

b) Sampling errors - these are errors that result from the difference between the sample data estimate and the entire population parameter, i.e. the mining universe. This type of error is strictly due to sampling techniques.

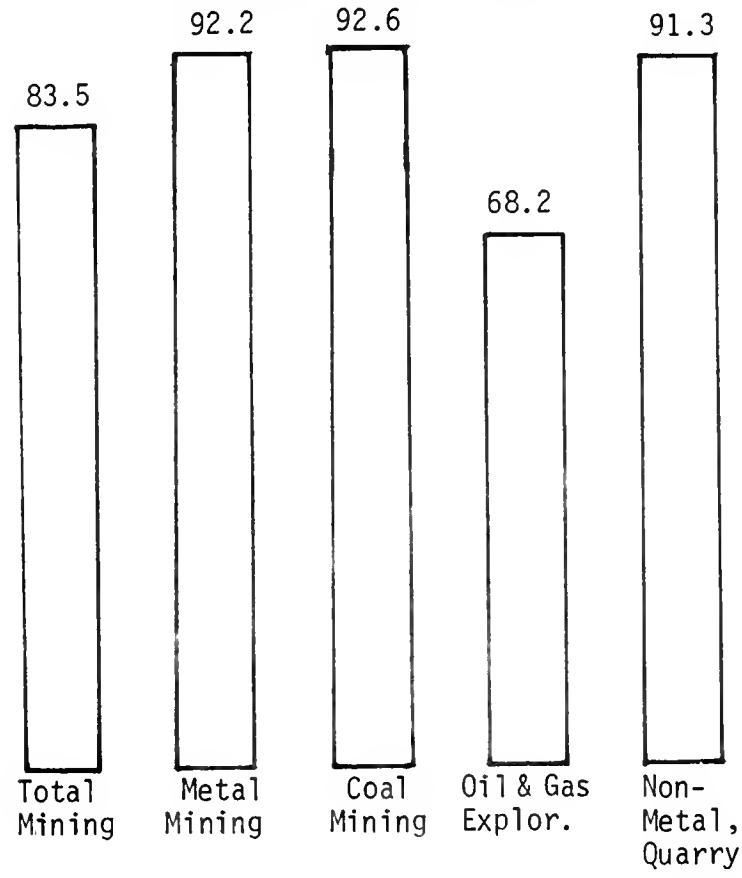
c) Standard errors - these errors are the square root of the variances of the estimates, where the variance of an estimate is equal to the product of squared and weighted sample observations and a series of correction factors needed when sampling from a finite population.

d) Relative error - these errors are an important tool in measuring the precision of an occupational employment estimate. Relative error expresses the standard error of an estimate as a percentage of that estimate, i.e. relative error times occupational employment estimate is equal to the standard error. More precisely, if there are 100 managers and officers in coal mining and relative error is 10 percent, then the standard error is simply 10. For example, assume we estimate a total of 300 managers and officers in all the size classes in the mining industry, and the standard error is computed as 40. This error measures the precision about the estimate of 300 managers and officers. Applying the formula, the relative error, then, expressed as a percent, is simply: $\frac{40 \times 100}{300} =$ 13.33%, at one standard deviation. That is, at one standard deviation from the true mining universe population of managers and officers, our estimate of 300 gives us a relative error of 13.33% at a level of confidence of 68%. Therefore, we can say that 68% of the time our estimate will be $300 \pm (.1667 \times 300)$, or between 260 and 340 managers and officers. Because of the fluctuation of the relative error from one occupational characteristic to another, an optimum sample design is virtually non-attainable.

NOTE: Only those specific occupations with a relative error 50% or less were put in the publication. All occupations with relative error greater than 50% were put in the residual "all other" categories. As such the relative error was not computed for the residual categories.

MOES SAMPLE FOR THE MINING INDUSTRY

Mining:
Survey Response (Percent)



Mining: Sample Employment
As A Percent Of The Universe